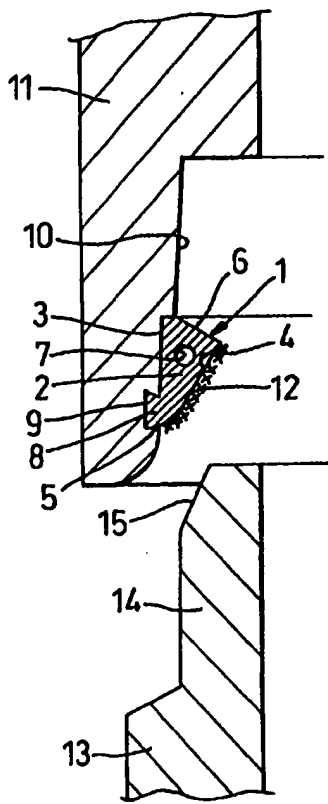




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : F16L 21/03</p>	<p>A1</p>	<p>(11) International Publication Number: WO 99/24750</p> <p>(43) International Publication Date: 20 May 1999 (20.05.99)</p>
<p>(21) International Application Number: PCT/GB98/03311</p> <p>(22) International Filing Date: 4 November 1998 (04.11.98)</p> <p>(30) Priority Data: 9723561.8 8 November 1997 (08.11.97) GB</p> <p>(71) Applicant (for all designated States except US): GLYNWED PIPE SYSTEMS LIMITED [GB/GB]; St. Peters Road, Huntingdon, Cambridgeshire PE18 7DJ (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): WILDGOOSE, Thomas, William [GB/GB]; 5 Farrington Close, Peterborough DE1 4RQ (GB).</p> <p>(74) Agent: BARKER BRETTELL; 138 Hagley Road, Edgbaston, Birmingham B16 9PW (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>
<p>(54) Title: JOINTING RING</p> <p>(57) Abstract</p> <p>A jointing ring or gasket (1) for or included in a pipe, or a pipe joint, has a part (4) including an integral non-stick solid material (12) which provides the part with a low friction surface. The ring or gasket may be used in a spigot and socket pipe joint with the part of non-stick material being externally or internally of the ring or gasket, and being an approach part or sealing part thereof. There may be more than one such part. Another application of the ring or gasket is around a segment for a pipe-like structure. The non-stick material may be applied as a coating to the or each part after the part has been formed, or it may be included in the jointing ring or gasket as it is formed. Preferably the non-stick material (12) is a plastics material, e.g. a fluoropolymer, which has low friction characteristics and is flexible.</p> 		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

JOINTING RING

This invention relates to jointing rings or gaskets for pipes, and
5 joints incorporating jointing rings or gaskets.

The invention has relevance, but not exclusively, to jointing rings
or gaskets for providing a seal in a pipe joint of the spigot and socket
kind. Such rings or gaskets are usually made of an elastomeric material.

10

It is to be understood that the expression "pipe" as used herein is
intended to include pipes and tubes as such, and also pipe-like fittings
used within pipework such as elbows, 'T' bends and valves incorporated
in pipe work and having parts of a pipe-like nature, and pipe-like
15 structures such as tunnels, shafts or linings assembled from segments,
such as made as concrete castings, which fit together and are sealed, for
example against water ingress, at their joints by gaskets applied to the
segments.

20 Joints of the above-mentioned spigot and socket kind are utilised in
the inter-connection of pipes of water or gas carrying capability, for
example, and comprise a socket at one end of a pipe within which is
located an annular jointing ring or gasket which is sealingly engageable
with a spigot of the next adjacent pipe on insertion into the socket so as to
25 provide a sealed joint. As a jointing ring or gasket which provides a seal
in such a joint must have good sealing contact with the socket and spigot
at a joint, force is required to engage the spigot in the jointing ring or
gasket. Without application of lubrication the force required can be quite
substantial. The force required can be reduced appreciably by the
30 application of lubrication to the jointing ring or gasket. The conventional

way of lubricating a jointing ring or gasket is to apply a coating of a liquid soap solution, usually by brush, on the jointing ring or gasket. A problem with this is that in many working situations where pipe joints have to be made, for example outdoors in dug trenches, there is a strong
5 likelihood of the coated jointing ring or gasket becoming soiled with dirt, debris, grit or other foreign matter from the surroundings, which sticks to the soap solution before the joint is made. That soiling can reduce the effectiveness of the lubrication and, more seriously, it can result in an unsatisfactory seal being produced at the pipe joint. Apart from that the
10 process of applying the coating to the jointing ring or gasket takes time, involves additional equipment to be used by the pipe fitter and tends to be messy.

In the case of segments for the construction of pipe-like structures,
15 the segments are each shaped to form part of the required circumferential shape. They are assembled and secured together to make up the circumferential shape. Gaskets are provided around the peripheries of the segments to seal adjacent segments together, the gaskets usually being located and bonded in grooves in the peripheries and extending
20 continuously, like frames, around the peripheries. It is usually essential that good sealing contact is made between the gaskets of adjacent segments but it can happen that the gaskets can be moved and even become detached from the grooves as segments are manoeuvred into position, and adjusted so that seals are not properly made. The
25 elastomeric material of which the gaskets are made has a tendency to develop a high friction condition so that when adjacent gaskets are brought together they are likely to adhere to one another and relative movement then between their respective segments can break the bonding of the gaskets in their grooves, and even cause the gaskets to become
30 detached from the grooves. As an aid to preventing this, lubrication is

applied to the gaskets to enable them to slip over one another as the segments are moved, the lubrication conventionally being a liquid soap solution such as used for the spigot and socket kind of joint described above, and similarly applied usually by brush. Similar problems arise
5 from the use of that lubrication.

The present invention seeks to avoid the above-mentioned shortcomings associated with the conventional lubrication of jointing rings or gaskets.

10

According to a first aspect of the present invention there is provided a jointing ring or gasket for a pipe having a part including an integral non-stick solid material which provides the part with a low friction surface.

15

According to a second aspect of the present invention there is provided a joint which includes a jointing ring or gasket in accordance with the foregoing first aspect of the present invention disposed between connected components of the joint.

20

When the jointing ring or gasket is to be used for a spigot and socket pipe joint the part of non-stick material may be an approach part at which the ring or gasket is introduced to the spigot or socket for engagement therewith.

25

If the jointing ring or gasket is to be applied to a segment for a pipe-like structure, the part or parts which are to make contact with another segment, or other segments, with which the segment is to be assembled may be of the non-stick material.

30

Preferably the non-stick material is a plastics material which has low friction characteristics and is flexible. The material may be a fluoropolymer, typically a polytetrafluoroethylene (PTFE) such as TEFLON (Registered Trade Mark).

5

The non-stick material may be applied as a coating to the formed part of the jointing ring or gasket. The coating may be applied in liquid form, for example by brushing, dipping or spraying, and then be baked to become a solid integral surface of the part. Alternatively, the non-stick material may be included in the jointing ring or gasket as the ring or gasket is formed. Thus when the jointing ring or gasket is made as a moulding, of an elastomeric material, the non-stick material may be included in the ring or gasket as it is moulded. If the jointing ring or gasket is made at least partially as an extrusion the non-stick material may be included by spraying it onto the extrusion or possibly by co-extrusion.

10
15

The remainder of the jointing ring or gasket may be made of any suitable material. It may be made of an elastomeric material, rubber or a mouldable polymeric material, such as commonly used for jointing rings or gaskets. The jointing or gasket ring may include a holding ring, in accordance with the jointing gasket provided in our GB Patent Application 97150775, or a resilient holding ring, such as a spring, in accordance with the jointing ring provided in our GB Patent Application 9716144.2.

20
25

The jointing ring or gasket may be of a torodial form or it may be of a generally sleeve-like form. The part of non-stick material may be inclined or ramped.

For a spigot and socket pipe joint the part may comprise a flared mouth of the jointing ring or gasket, for example, or an internal flap, flange or other sealing portion which may be bodily inclined or have an inclined surface for sealing engagement with the spigot. Another
5 possibility is for the part to be a ramped part at the exterior of the jointing ring or gasket, or an external flap, flange or other sealing portion which may be bodily inclined or have an inclined surface for sealing engagement with the socket. There may be two of the parts, one for engagement with the spigot and the other for engagement with the socket.

10

The jointing ring or gasket may be fitted as an original part of a pipe manufactured to be connected to another pipe by a spigot and socket joint. It may be fitted as an original part of a segment manufactured for use in a pipe-like structure.

15

According to a third aspect of the present invention a pipe is provided having a socket in which is located a jointing ring or gasket in accordance with the foregoing first aspect of the invention the part of which of non-stick material is disposed to be introduced to a spigot of a
20 second pipe for reception of the spigot into the socket to form a sealed joint between the pipes.

According to a fourth aspect of the present invention a pipe is provided having a spigot on which is located a jointing ring or gasket in
25 accordance with the foregoing first aspect of the invention the part of which of non-stick material is disposed to be introduced to a socket of a second pipe for the socket to receive the spigot to form a sealed joint between the pipes.

According to a fifth aspect of the present invention a segment for a pipe-like structure is provided having located thereon a jointing ring or gasket in accordance with the foregoing first aspect of the invention the part of which of non-stick material is disposed for contact with a jointing
5 ring or gasket of another segment.

The jointing ring now provided facilitates the making of a joint between pipes or segments. Tests have been carried out using a jointing ring or gasket in accordance with the first aspect of the invention located
10 in the socket of a first pipe and having a part with an integral PTFE coating for the introduction of the spigot of a second pipe into the jointing ring or gasket and socket. These tests showed that the force required to insert the spigot through the jointing ring or gasket and the socket was only about one third of that required to make such a joint with a similar
15 type of known jointing ring or gasket devoid of a non-stick material and without having a lubricant applied to it. The reduced force required was comparable to that needed when a liquid soap lubricating solution is applied in the conventional way. The jointing ring or gasket now provided, however, has the advantages over the known rings or gaskets
20 lubricated with a liquid soap solution that it is cleaner to use, there is no need for the fitter to apply a lubricant and there is considerably less risk of the jointing ring or gasket becoming soiled by dirt or other foreign matter at the working situation where the joint is made. If a pipe or segment is supplied to site already fitted with the jointing ring or gasket
25 the joining of the pipe to, or the assembling of the segment with, another is facilitated further.

Some embodiments of the invention are shown by way of example only in the accompanying drawings, in which:

Figures 1 and 2 are fragmentary sections through two different spigot and socket pipe joints, each shown separated, in the sockets of which jointing rings in accordance with the first aspect of the invention are located;

5

Figure 3 is a fragmentary section through a further spigot and socket pipe joint, also shown separated, in which a jointing ring in accordance with the first aspect of the invention is located on the spigot, and

10

Figure 4 is a perspective view of a segment for tunnel construction including a jointing gasket in accordance with the first aspect of the invention.

15 In the embodiments illustrated by Figures 1 to 3 the jointing rings 1 have annular bodies 2 made as mouldings of a resilient elastomeric material such as natural or synthetic rubber.

Referring to Figure 1, the jointing ring 1 has its annular body 2 of a generally wedge-shaped section having a cylindrical external surface 3 and an inclined internal surface 4 which inclines inwardly from a forward, entry, end 5 of the jointing ring, thereby increasing the thickness of the section towards a rearward end 6 of the ring. An annular helically coiled spring 7 is contained within the thicker part of the section of the body 2 towards the rearward end 6. Adjacent to the forward end 5 an annular rib 8 projects from the external surface 3 and engages in an annular internal groove 9 in a socket 10 of a first pipe 11 to locate the jointing ring in the socket, near to the mouth of the socket.

The inclined surface 4, which constitutes an approach part of the jointing ring, has a coating 12 of PTFE applied to it. The PTFE is sprayed onto the inclined surface and then baked so that it is solid, yet flexible, and becomes an integral part of the body 2 of the jointing ring.

5 This is done in the course of manufacture of the jointing ring before it is located in the socket of the first pipe 11. With the PTFE coating 12 the inclined surface 4 becomes a low friction surface.

The first pipe 11 is joined to a second pipe 13 by pushing a

10 spigot 14 of the latter into the socket 10 of the first pipe through the jointing ring. As the spigot is inserted a bevelled end edge 15 of the spigot engages with the inclined surface 4 of the jointing ring and the PTFE coating 12 allows the spigot to pass through the ring without excessive force being necessary. The body 2 becomes resiliently

15 compressed as the spigot is pushed through the jointing ring and a good seal is thus achieved at the joint.

In the embodiment of Figure 2 the jointing ring 1 has its annular body 2 of a generally triangular section with the base thereof presenting a

20 cylindrical internal surface 16 of the body. An inwardly inclined sealing flap 17 projects from the internal surface 16, being joined to the body for approximately half of its axial length from a forward, entry, end 18 of the jointing ring. A forwardly directed surface 19 of a sealing flap 17 constitutes an approach part of the jointing ring and has a coating 20 of

25 PTFE applied to it in similar manner to the coating 12 in the first described embodiment.

The triangular section body 2 engages in a complementary internal recess 21 formed in a socket 22 of a first pipe 23 so as to locate the

30 jointing ring 1 in the socket, the sealing flap 17 projecting into the bore

of the socket 22 with the coated forwardly directed surface 19 facing the mouth of the socket.

As before, a spigot 24 of a second pipe 25 to be joined to the first
5 pipe 23 is pushed into the socket 22 of the first pipe through the jointing
ring 1, a bevelled end edge 26 of the spigot 24 engaging with the
forwardly directed surface 19 of the sealing flap 17. The PTFE
coating 20 allows the spigot to pass readily through the jointing ring to
make the joint. As the spigot 24 passes through the jointing ring, the
10 sealing flap 17 is resiliently urged outwardly into compressive
engagement with the cylindrical internal surface 16 of the body 2 so that a
good seal is again provided at the joint.

Referring now to Figure 3, in this embodiment the jointing ring 1
15 has its annular body 2 of a generally wedge-shaped section which is
inside out as compared with the body of the jointing ring in the first
described embodiment. Here the body 2 has a cylindrical internal
surface 27 and an inclined external surface 28 which inclines outwardly
from a forward end 29 of the jointing ring. The inclined external
20 surface 28 is rounded towards the thicker rearward portion of the body 2.

The inclined external surface 28 constitutes an approach part of the
jointing ring and has a PTFE coating 30 applied to it, in a similar manner
to the PTFE coatings of the other two embodiments.

25

To make a joint between a first pipe 31 and a second pipe 32 the
jointing ring is located in an external annular groove 33 in a spigot 34 of
the first pipe. The inclined external surface 28 of the located jointing
ring projects from the groove 33. As the spigot 34 is pushed into a
30 socket 35 of the second pipe 32, the inclined external surface 28 of the

jointing ring engages with an internally bevelled edge 36 of the mouth of the socket and the body of the jointing ring becomes compressed as the ring is pushed with the spigot into the socket. The PTFE coating 30 on the inclined external surface 28 allows the jointing ring to enter with
5 relative ease into the socket but the compression of the body of the inserted jointing ring provides a good seal between the two joined pipes.

Referring now to Figure 4, a segment 37 is shown, made for example as a concrete casting, which is intended for use in the
10 construction of a tunnel. The segment 37 is of arcuate rectangular shape and assembles with others, as indicated at 37', 37'', 37''', 37''', circumferentially and axially to form a required tunnel structure. It has a flanged periphery 38 at which it is bolted to the adjacent segments. Extending along all four side edges of the periphery 38 of the segment 37
15 is a peripheral groove 39. Located in the groove 39 is sealing gasket 40 which is in one-piece and four-sided to extend all around the periphery of the segment. The sealing gasket 40 is made from an extrusion of a resilient elastomeric material, such as natural or synthetic rubber. Its cross-section is of a width to fit tightly in the groove 30 and it is of a
20 depth to protrude out of the groove. The protruding part 41 has a coating 42 of PTFE applied to it, the PTFE being sprayed on and then baked to become solid and an integral part of the gasket. Thus the PTFE coating 42 provides the protruding part 41 with a low friction surface.

25 The PTFE coating is applied in the course of manufacture of the gasket before the gasket is attached to the segment 37.

The gasket 40 is sufficiently resilient to enable it to be engaged in the groove 39, where it contracts to engage tightly in the groove.
30 Adhesive secures the gasket in the groove.

In the construction of a tunnel the segment is located edge to edge axially and circumferentially with other segments 37', 37'', 37''', 37'''' also fitted with similar gaskets to seal the segments together in the structure. The PTFE coating 42 of the gasket and of the gaskets of the other segments enables the gaskets to slip easily over one another as the segments are manoeuvred into position, and adjustments of their positions are made to ensure their proper location. This facilitates appreciably the assembling of the segments and avoids movements of the gaskets relative to their respective segments, and possible undesirable detachment of gaskets from the grooves in the segments.

CLAIMS

1. A jointing ring or gasket for a pipe characterised in that it has a part (4, 19, 28, 41) including an integral non-stick solid
5 material (12, 20, 30, 42) which provides the part with a low friction surface.

2. A jointing ring or gasket according to claim 1 characterised in that the part (4, 19, 28, 41) of non-stick material is an approach part at which
10 the ring or socket is introduced to a spigot or socket of a pipe for engagement therewith.

3. A jointing ring or gasket according to claim 1 which is made to be applied to a segment for a pipe-like structure and characterised in that the
15 part (41) of non-stick material is at least one part of the ring or gasket which is to make contact with the segment or segments with which the segment is to be assembled to form the pipe-like structure.

4. A jointing ring or gasket according to any preceding claim
20 characterised in that the non-stick material is a plastics material which has low friction characteristics and is flexible.

5. A jointing ring or gasket according to claim 4 characterised in that the plastics material is a fluoropolymer.

25

6. A jointing ring or gasket according to claim 5 characterised in that the plastics material is polytetrafluoroethylene.

7. A jointing ring or gasket according to any preceding claim characterised in that the non-stick material is applied as a coating to said part (4, 19, 28, 41) after the part has been formed.

5 8. A jointing ring or gasket according to any of claims 1 to 6 characterised in that the non-stick material is included in said part (14, 19, 28, 41) as the ring or gasket is formed.

9. A jointing ring or gasket according to claim 8 characterised in that
10 it is made as a moulding.

10. A jointing ring or gasket according to claim 8 characterised in that it is made at least partially as an extrusion, the non-stick material being included by spraying it onto the extrusion.

15

11. A jointing ring or gasket according to claim 8 characterised in that it is made at least partially as an extrusion, the non-stick material being included as a co-extrusion with the extrusion.

20 12. A jointing ring or gasket according to any preceding claim characterised in that except for the non-stick material the ring or gasket is made of an elastomeric material.

13. A jointing ring or gasket according to any preceding claim
25 characterised in that it includes a holding ring.

14. A jointing ring or gasket according to claim 13 characterised in that the holding ring is resilient.

14

15. A jointing ring or gasket according to claim 14 characterised in that the holding ring is a spring.
16. A jointing ring or gasket according to any preceding claim
5 characterised in that it is of a toroidal form.
17. A jointing ring or gasket according to any of claims 1 to 15 characterised in that it is of a generally sleeve-like form.
- 10 18. A jointing ring or gasket according to any preceding claim characterised in that the part (4, 19, 28) of non-stick material is inclined or ramped.
- 19 A jointing ring or gasket according to claim 2 or any of claims 4
15 to 18 as dependent from claim 2 characterised in that the part (4, 19) of non-stick material is a flared mouth of the ring or gasket.
20. A jointing ring or gasket according to claim 18 as dependent from claim 1 or any of claims 4 to 17 which is made to be used in a spigot or
20 socket pipe joint and characterised in that the part (19) of non-stick material is an internal flap, flange or other sealing portion which is bodily inclined or has an inclined surface for sealing engagement with the spigot of the pipe joint.
- 25 21. A jointing ring or gasket according to claim 18 as dependent from claim 1 or any of claims 4 to 17 which is made to be used in a spigot or socket pipe joint and characterised in that the part (28) of non-stick material is a ramped part at the exterior of the ring or gasket, or an external flap, flange or other sealing portion which is bodily inclined or

has an inclined surface for sealing engagement with the socket of the pipe joint.

22. A jointing ring or gasket according to claims 20 and 21
5 characterised in that it has two of said parts (19, 28) of the non-stick material, the one part being that which has sealing engagement with the spigot of the pipe joint and the other part being that which has sealing engagement with the socket of the pipe joint.
- 10 23. A pipe joint characterised in that it includes a jointing ring (1) or gasket (40) as claimed in any preceding claim disposed between connected components (10,14; 23, 25; 31, 31; 37, 37', 37'', 37''', 37''''') of the joint.
- 15 24. A pipe characterised in that it includes a jointing ring (1) or gasket (40) as claimed in any of claims 1 to 22.
25. A pipe having a socket (10) and characterised in that located in the socket (10) is a jointing ring (1) or gasket as claimed in any of claims 1
20 to 22 the part (4) of which of non-stick material is disposed to be introduced to a spigot of a second pipe for reception of the spigot into the socket to form a sealed joint between the pipes.
26. A pipe having a spigot (34) and characterised in that located in the
25 spigot (34) is a jointing ring (1) as claimed in any of claims 1 to 22 the part (28) of which of non-stick material is disposed to be introduced to a socket of a second pipe for the socket to receive the spigot to form a sealed joint between the pipes.

27. A segment (37) for a pipe-like structure characterisd in that it has located thereon a jointing gasket (40) as claimed in claim 3 or any of claims 4 to 18 the part (41) of which of non-stick material is disposed for contact with a jointing gasket of another segment.

1/2

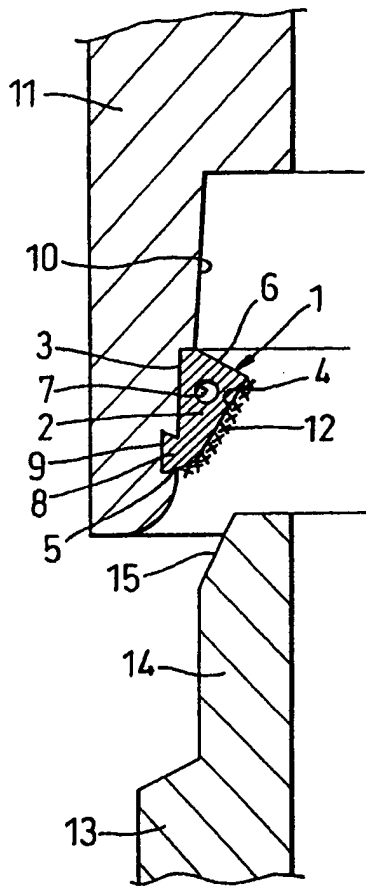


Fig. 1

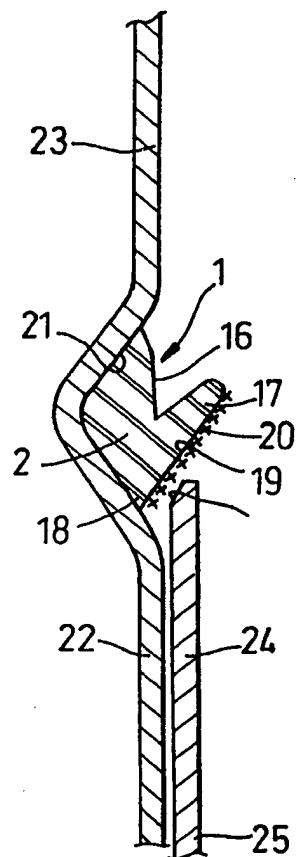


Fig. 2

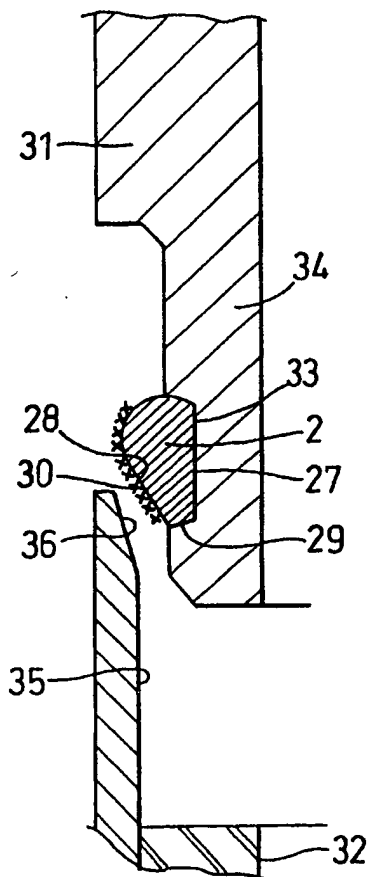
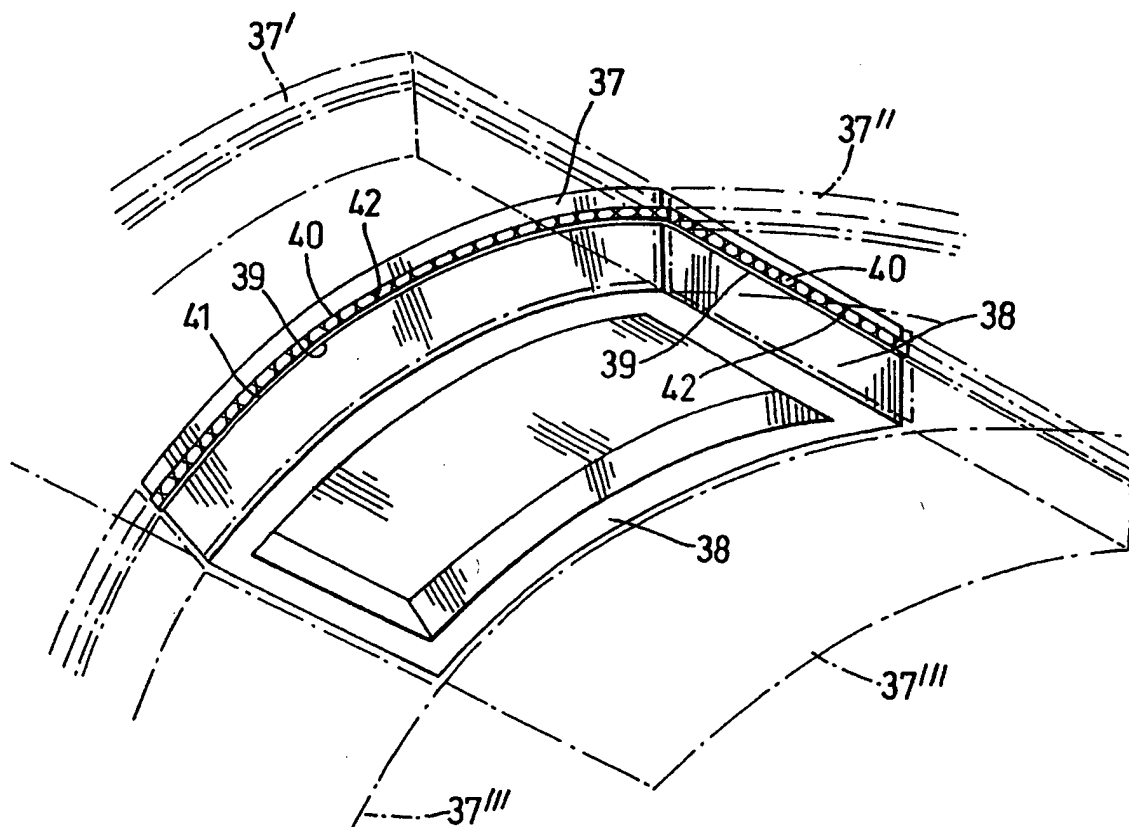


Fig. 3

2/2

**Fig. 4**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03311

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F16L21/03

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 35138 A (STEINHOFF ALBERT GMBH ;GRABE WERNER (DE); PHOENIX AG (DE); HENNING) 25 September 1997 see abstract; figure 1 ---	1-4, 7-13, 17-27
X	DE 33 10 264 A (PHOENIX AG) 27 September 1984 see page 8, line 10 - line 18; page 9, line 13 - line 15 ---	1-4, 8, 10-12, 16, 20
P, X	DE 196 28 639 A (CORDES THEODOR GMBH & CO KG) 29 January 1998 see column 1, line 19 - line 25; claims 5-8 ---	1, 4-7
A	---	17-19
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 February 1999

Date of mailing of the international search report

08/03/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Schlabbach, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03311

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 86 01 478 U (MUECHER HERMANN GMBH) 2 September 1993 see claim 5 ---	1-27
A	DE 38 41 330 A (MUECHER HERMANN GMBH) 13 June 1990 see abstract ---	13, 14
A	DE 41 12 976 A (PHOENIX AG) 22 October 1992 see abstract ---	1-27
A	DE 38 26 622 A (CONTINENTAL AG ;CORDES THEODOR GMBH & CO KG (DE)) 8 February 1990 see abstract -----	1-27

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/03311

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9735138 A	25-09-1997	EP 0888511 A	07-01-1999
DE 3310264 A	27-09-1984	NONE	
DE 19628639 A	29-01-1998	NONE	
DE 8601478 U	02-09-1993	NONE	
DE 3841330 A	13-06-1990	NONE	
DE 4112976 A	22-10-1992	NONE	
DE 3826622 A	08-02-1990	NONE	